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Nuclei in a supersaturated solution. Utrecht chemists and the crystallization of international relations after the First World War

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ABSTRACT

The mobilization and involvement of chemists in the First World War revealed the protean nature of science. This harsh knock to the pre-war optimistic views on the societal role of science reverberated the following decade in the deeply divided international scientific community. In the dark shadows of the war and the breakdown of scientific internationalism, the Utrecht chemists Ernst Cohen and Hugo Kruyt attempted to lighten up the international sphere of chemistry. This study focusses on their main informal effort to reunite chemists from former belligerent nations at the 1922 'International Chemical Reunion Utrecht'. This is the first detailed empirical elaboration of the thesis that reconstruction in the 1920s proceeded most importantly through unofficial contact. Despite recent scepticism about this historiographical image in general and the impact and political insight of these Dutch mediators in particular, this article argues that they acted empathically and achieved a unique success in the scientific world. Although science failed to take a moral leading role in European society, the continuous and subtle activity of the Utrecht chemists in the informal and formal networks of chemistry ultimately led to the only complete restoration of an international scientific community before the advent of the Second World War.

Keywords: Physical chemistry; international mediation; interwar period

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Salvete, amici doctissimi, qui variis ex partibus Americae et Europae huc convenistis, ut de argumentis, quae ad disciplinas naturales pertinent, agatis, Salvete![1]

Introduction

On the afternoon of Wednesday 21 June 1922, Professor Ernst Julius Cohen (1869–1944) opened the International Chemical Reunion Conference at Utrecht in the *lingua franca* of early modern science. Speaking in the Van 't Hoff laboratory in front of about forty prominent chemists from all over the world, he effortlessly continued in French, German and English to welcome all his guests.[2] Bilingual by upbringing and a disciple of the first Dutch Nobel prize winner, Jacobus van 't Hoff, Cohen was international through and through: 'as many languages one speaks, as many times one is human'![3] Cohen's 'curious convention' aspired to 'make the chasm disappear' that the First World War had created between chemists from the Central Powers and the Entente nations.[4] In the following decade, in which the definite downfall of scientific internationalism became manifest, the attempts of Utrecht chemists at restoration of an international chemical community would ultimately succeed in a unique fashion.

The large scale mobilization of chemists and their consecutive intensive involvement in warfare atrocities has made historians speak of the 'chemists' war'.[5] The ubiquitous use of chemical agents at the front poisoned and killed thousands. It also generated a 'poisoned atmosphere' in the relatively small international chemistry community, both during and after the war.[6] The distortion of the international scientific world in the wake of the war was most clearly seen through the statutory exclusion of the Central Powers by the Entente nations in the newly founded International Research Council (IRC). This boycott also affected all disciplinary unions and would last until 1926.[7] Before the war, German science, and chemistry in particular, was leading in research and education. The German language and reference publications were dominant in the world of chemistry

1 'Welcome, most learned friends, which come together here from various parts of America and Europe, to have discussions that belong to the natural sciences, welcome!' Cf. E.J. Cohen, *Na driekwart eeuw; levensherinneringen* (Utrecht 2013) 196.

2 W.P. Jorissen, 'Réunion Internationale de Chimie a Utrecht, 21–24 Juin 1922', *Chemisch Weekblad* 41 (1922) 418–425, esp. 420.

3 E.J. Cohen, 'Qua vadimus?', offprint from *Chemisch Weekblad*, 41 (1919) 16. (Utrechts Universiteitsmuseum (UUM 36.1).

4 The Central Powers consisted of Germany, Austria, Bulgaria and Hungary. The Entente consisted originally of Russia, France and Germany. Cf. H.R. Kruyt, 'Herinneringen', *Chemisch Weekblad* 25 (1928) 342–344, esp. 344; E.J. Cohen, 'Chemisch-historische aanteekeningen XIX. De chemie te Utrecht in den loop der eeuwen II', offprint from *Chemisch Weekblad* (14 June 1941) esp. 14. (UUM 36.1).

5 R. MacLeod, 'The chemists go to war: the mobilization of civilian chemists and the British war effort, 1914–1918', *Annals of Science* 50 (1993) 455–481, esp. 458; H. Rose & S. Rose, *Science and society* (Harmondsworth 1969) 37–57.

6 Donnan to Arrhenius, 7 January 1920, Kungliga Vetenskapsakademien, Stockholm (KVA) Brevkatalogen.

7 A.G. Cock, 'Chauvinism and internationalism in science; the International Research Council, 1919–1926', *Notes and Records of the Royal Society of London* 37:2 (1983) 249–288; P. Forman, 'Scientific internationalism and the Weimar physicists: the ideology and its manipulation in Germany after World War I', *Isis* 64:2 (1973) 150–180; D.J. Kevles, 'Into hostile political camps: the reorganization of international science in World War I', *Isis* 62:1 (1971) 47–60.

and a majority of chemists had received a part of their education in the German Empire.[8] The spirit of internationalism was strong in chemistry, especially because international agreement on values like atomic weight was essential to science and trade.[9] The comprehensive boycott of German science in the 1920s was thus catastrophic, as international scientific bureaus were relocated to Entente nations, German was expelled as the language of science and Central Power scientists were not invited to 75% of international conferences abroad.[10]

As there was a harsh ostracism on the level of international scientific organizations, it has been claimed that reconstruction of international relations proceeded most importantly through informal contacts and private meetings.[11] The 1922 conference at Cohen's laboratory is often presented as a pioneering unofficial effort, but has not been thoroughly studied up to now.[12] Zooming in on the mediating efforts of Cohen and his right-hand man Hugo Kruyt will self-evidently bring into play the tension between their informal attempts and the 'de facto non-international' organization of chemistry in the International Union for Pure and Applied Chemistry (IUPAC).[13] The main objective here is to make the motivation

8 P. Alter, 'Die Kaiser-Wilhelm-Gesellschaft in den deutsch-britischen Wissenschaftsbeziehungen', in: R. Vierhaus e.a. ed., *Forschung im Spannungsfeld von Politik und Gesellschaft* (Stuttgart 1990) 726–746, esp. 726–727; D.M.E. Fauque, 'French chemists and the international reorganisation of chemistry after World War I, *Ambix* 58:2 (2011) 116–135, esp. 127; V.N. Ipatieff, *The life of a chemist. Memoirs of V.N. Ipatieff* (Palo Alto 1946) 347; S. Onghena, 'The survival of 19th century scientific optimism: the public discourse on science in Belgium in the aftermath of the Great War (ca. 1919–1930)', *Centaurus* 53:4 (2011) 280–305, esp. 284–285; R. Reinbothe, 'Deutsch als internationale Wissenschaftssprache und der Boykott nach dem Ersten Weltkrieg', *Duisburger Arbeiten zur Sprach- und Kulturwissenschaft* (Frankfurt am Main 2006); B. Schroeder-Gudehus, 'Challenge to transnational loyalties: international scientific organizations after the first world war', *Social Studies of Science* 3:2 (1973) 93–118, esp. 98–99, 102; S. Widmalm, 'Science and neutrality: the Nobel Prizes of 1919 and scientific internationalism in Sweden', *Minerva* 33 (1995) 339–360, esp. 343.

9 N.E. Holden, 'Atomic weights and the international committee – a historical review', *Chemistry International* 26:1 (2004) 4–7.

10 The *Bureau for Physico-Chemical Standards,* for example, was instituted in Brussels by the IUPAC in 1921 to make the *Physikalisch-Technische Reichsanstalt,* situated in Charlottenburg, redundant. L. D'or, 'Notice sur Jean Timmermans', *Annuaire de l'Académie royale de Belgique* 148 (1982) 63–78, esp. 66. At the first meeting of the IUPAC, German was not amongst the official conference languages. Reinbothe, 'Deutsch' (n. 8) 393. The number of conference exclusions rises to 90% when only meetings in former belligerent nations are taken into account. B. Schroeder-Gudehus, *Les scientifiques et la paix: la communauté scientifique internationale au cours des années 20* (Montréal 1978) 133–135; B. Schroeder-Gudehus, 'Internationale Wissenschaftsbeziehungen und auswärtige Kulturpolitik 1919–1933. Vom Boykott und Gegen-Boykott zu ihrer Wiederaufnahme', in: R. Vierhaus & B. vom Brocke (eds.), *Forschung im Spannungsfeld von Politik und Gesellschaft* (Stuttgart 1990) 858–885, esp. 860.

11 E. Crawford, *Nationalism and internationalism in science, 1880–1939: four studies of the Nobel population* (Cambridge, USA 1992) 68–71; R. Schenck, 'Ein internationaler wissenschaftlicher Kongress in Utrecht', *Zeitschrift für Angewandte Chemie* 35 (1922) 558–559; M. Szöllösi-Janze, *Fritz Haber, 1868–1934: eine Biographie* (München 1998) 590.

12 Crawford, *Nationalism* (n. 11) 68–69; Kruyt, 'Herinneringen' (n. 4) 344; W. Otterspeer & J. Schuller tot Peursum-Meijer, *Wetenschap en wereldvrede. De Koninklijke Akademie van Wetenschappen en het herstel van de internationale wetenschap tijdens het interbellum* (Amsterdam 1997) 179; G.J. Somsen, "Holland's Calling': Dutch scientists as international mediators in the interwar period', in: S. Widmalm, G. Somsen & R. Lettevall (eds.), *Neutrality: science, culture and politics after the First World War* (New York 2012) 45–64, esp. 55; K. van Berkel, *De stem van de wetenschap: geschiedenis van de Koninklijke Nederlandse Akademie van Wetenschappen. Deel 2: 1808–1914* (Amsterdam 2011) 104.

13 E.J. Cohen, 'Hugo Rudolph Kruyt 1908–1933', in: *Hugo Rudolph Kruyt 1908–1933. Ter herdenking van zijn 25-jarig doctoraat* (Amsterdam 1933) 3–47, esp. 29. For the life and work of Cohen and Kruyt, see: Cohen, *Na driekwart eeuw* (n. 1) and G.J. Somsen, *Wetenschappelijk onderzoek en algemeen belang. De chemie van H.R. Kruyt (1882–1959)* (Delft 1998).

and reception of their informal efforts visible for the first time. With regard to the change the Utrecht chemists achieved, historiography for long relied on (auto-)biographical displays of the actors involved.[14] Recently, scepticism was raised by Geert Somsen about their deemed 'enormous impact', who instead suggested that the Dutch mediators fostered a 'lack of empathy'.[15] Brigitte Schroeder-Gudehus further criticizes the idea of informal reconstruction as it seems to have been invoked to challenge the unwelcome pessimistic view on science and its internationalist ideals.[16] This detailed study of concrete practices is the only way to evaluate to what extent the International Reunion of Chemists can indeed be considered a 'nucleus in a supersaturated solution' that set in motion the crystallization of international chemistry.[17]

Immiscible international science

Before the end of the war, still livid over the manifesto *An die Kulturwelt!* ('To the Civilized World') and the alleged German initiation of chemical warfare, scientists from the Entente nations designed plans for post-war international organizations that explicitly ostracized scientists from Central Powers for the following decade at least.[18] The Koninklijke Nederlandse Akademie der Wetenschappen (Royal Netherlands Academy of Arts and Sciences – KNAW) took a waiting attitude over these developments, and was wary not to insult either side as to maintain its neutrality.[19] It led to heated discussions in Amsterdam, where the Groningen chemist Jaeger advocated collective action together with other neutral academies. Cohen, exemplary for the Dutch cautious attitude, specifically turned down a Swiss proposal for an exploratory meeting amongst neutrals for being 'not fair' as negotiations for entry into the International Research Council had already started. Eventually, the KNAW, like organizations from other neutral nations, entered the IRC under the condition that it would not abolish contact with the excluded academies. Cohen, chairing the newly founded Chemische Raad van Nederland (Chemical council of the Netherlands), joined the IUPAC under similar conditions.[20] The circumspect and conditional entry by the Dutch into the formal international organizations was not unwarranted, as neutral

14 Otterspeer & Schuller tot Peursum-Meijer, *Wetenschap en Wereldvrede* (n. 12) 179; Van Berkel, *De stem van de wetenschap* (n. 12).

15 Kruyt, 'Herinneringen' (n. 4) 343. Somsen identifies a chasm between the pretensions and the effects of the Dutch mediators. He observes that their 'eagerness to report' on the 'moral mission' conflicts with the not unilateral positive foreign responses. These coloured public portrayals reinforced the historiographical self-image of the Netherlands as 'gidsland' (guiding nation) – an image he sets out to deconstruct. Somsen, 'Holland's Calling' (n. 12) 52–57.

16 This has often been based on an unsupported opposition between rank-and-file and elite scientists where the latter did not represent the former when acting as spokesperson on the formal stage. This argument does not apply to the case described here. B. Schroeder-Gudehus, 'Probing the master narrative of scientific internationalism: nationals and neutrals in the 1920s', in: Widmalm [e.a.] (eds.), *Neutrality* (n. 12) 19–42, esp. 27.

17 This metaphor is introduced by Voerman in his speech at the Reunion, see below. Jorissen, 'Réunion Internationale' (n. 2) 422.

18 In the manifesto that was published in 1914, ninety-three German artists and scientists expressed their discontent with the 'lies' spread about the German war effort. Amongst the signatories were the prominent chemists Ostwald and Haber. The latter sent the manifesto to Cohen, hoping to convince him of the German opinion. Haber to Cohen, 23 September 1914, Boerhaave Archives, Leiden (BAL).

19 Notulen Buitengewone Vergadering KNAW, 27 December 1919 & 28 February 1920, Noord-Hollands Archief, Haarlem (NAH), 64.13.

20 The institution of the Dutch Chemical Council, the organ representing Dutch chemical science and industry, was a requirement for entry into the IUPAC. Cf. Cohen, 'Hugo Rudolph Kuyt' (n. 13), 29.

nations were mistrusted by the Entente nations.[21] The inclusion of neutral nations was postponed until after the constitutive assembly of the IRC in 1919, as it was feared especially by Belgian and French scientists that they might attempt to loosen up the exclusionary politics.[22] A comparison with early Swedish efforts further points at insightful judgment by the Dutch academy. Already in 1917 explicit strategies were designed in Sweden to present itself as the new centre of international science as soon as the war would end. But in 1919 they had to conclude that they had met no understanding from foreign colleagues as the 'meddling of neutrals' was surrounded by sensitivity, and they resorted to the same conditional entry into the IRC.[23]

While the fog of war had not yet cleared, Cohen visited England in the spring of 1921 for a lecture tour.[24] During his stay in London, Cohen's lifelong friend Frederick G. Donnan (1870–1956) expressed his grief at the enduring disruption of contact between scientists of the world.[25] He saw Cohen as the right man to break the deadlock of 'hatred and misunderstanding', by organizing 'a rapprochement amongst the chemists of the world'.[26] There was much to say for Cohen as the man for the job as he was praised for his linguistic skills, worldly wisdom, patience and tactful humanity.[27] He maintained friendly relationships with many prominent foreign chemists that he met via Van 't Hoff in Amsterdam and Berlin, and working abroad with Henry Moissan in Paris and Svante Arrhenius in Stockholm.[28] His international reputation was established by the 1904 foundation of his own modern physical chemical laboratory in Utrecht, while he maintained Van 't Hoff's legacy by baptizing it with his name.

Enthusiastically, Cohen returned to Utrecht where he, Hugo Rudolph Kruyt and their organic chemistry colleague Pieter van Romburgh swiftly organized a small meeting with chemists from the different nations (see fig. 1).[29] Only the Belgian chemist Jean Timmermans, director of the IUPAC's 'International Bureau for Physico-Chemical Standards', refused the invitation, writing that at this moment it was 'impossible' for Belgian chemists

21 Schroeder-Gudehus, 'Probing the master narrative' (n. 16) 23.

22 Kevles, 'Into hostile political camps' (n. 7) 57.

23 S. Widmalm, "A superior type of universal civilization': Science as politics in Sweden, 1917–1926', in: Widmalm [e.a.] (eds.), *Neutrality* (n. 12) 65–89, esp. 72–73.

24 Cohen, 'Hugo Rudolph Kuyt' (n. 13), 31; Cohen, Na driekwart eeuw (n. 1) 186–192; F.G. Donnan, 'Happy days with Ernst Cohen' and W.P. Jorissen, 'Negen jaren uit het leven van een Utrechtsen chemicus: Ernst Cohen 1918–1927', in: W.P. Jorissen [e.a.] (ed.), *Ernst Cohen 1 okt. 1902 – 1 okt. 1927* (1927) 3–10, resp. 22–23.

25 Donnan and Cohen first met in 1896 as fellows, studying with Van 't Hoff in Berlin. Donnan, 'Happy days' (n. 24); H.A.M. Snelders, 'Cohen, Ernest Julius (1869–1944)', in: *Biografisch Woordenboek van Nederland* 1 (Den Haag 1979) 114–115.

26 Cohen, 'Hugo Rudolph Kuyt' (n. 13), 31; Donnan, 'Happy days' (n. 24).

27 G. Bredig, 'Erinnerungen an mein Amsterdamer Studienjahr 1894/5', in: Jorissen (ed.), *Ernst Cohen* (n. 24) 17–21; Jorissen, 'Negen jaren' (n. 24).

28 Amongst these were Arrhenius, Bredig, Donnan and Goldschmidt. See P. Faasse, *Profiel van een faculteit: de Utrechtse bètawetenschappen 1815–2011* (Hilversum 2012) 84; H.R. Kruyt, 'Levensbericht E.J. Cohen', *Jaarboek KNAW 1949–1950* (Amsterdam 1950) 265–274. Cohen was very explicit about the value of such international friendships. Cohen, 'Qua vadimus' (n. 3) 16.

29 In the end Biilman, Donnan, Henri, Schenck, Walden and Wegscheider attended this meeting, while Bruni and Arrhenius expressed their sympathy. Jorissen, 'Negen jaren' (n. 24) 3; Cohen, *Na driekwart eeuw* (n. 1) 192–193; Cohen to Arrhenius, 25 May 1921, KVA Brevkatalogen.

Fig. 1: Group picture at the intimate meeting in Cohen's garden, 1921. In the back row: Schenck (fifth from left), Wegscheider, Romburgh, Walden, Donnan, Cohen, Kruyt and Henri amongst Van 't Hoff laboratory students and employees. The exact identity of the women is unknown to the author. Collection Universiteitsmuseum Utrecht, inv.nr. 0285-25631-13.

'to renew personal relationships with the scientists across the Rhine'.[30] Strong cultural anti-German sentiments, caused by war atrocities like the raid of Leuven and a country torn open by trenches, overshadowed enduring high appraisal of German chemical science and industry.[31] The memory of the war was still painfully manifest in the Belgian lives and landscape, so that the scepticism regarding international cooperation is understandable. German chemists on the contrary were delighted with the initiative as 'reestablishment can only be successful from human to human, possibly by using old relationships'.[32] The short notice of the meeting indicates that old ties were revived. Several of the men were associated with the predecessor of the IUPAC, the 'Association Internationale des Sociétés Chimiques' (AISC), and their academic family trees shared many intellectual fathers like Van 't Hoff and Ostwald.[33] The meeting took place at the home and garden of Cohen, and at the closing dinner the informality of the event merged with its rationale of internationalism as each course was named after famous nineteenth century chemists from different nations: *Bouillon à la Rumford, Paté de Poisson, Langue de veau à Liebig, Petits poid Landolt* and *Bombe Berthelot.*[34]

30 R.E. Oesper, 'Jean Timmermans (1882-)', *Journal of Chemical Education* 16:11 (1939) 501; D'or, 'Notice' (n. 10) 66–68. Timmerman's reaction is quoted by Cohen in a letter to Moureu, 3 May 1922, BAL, manuscript of Cohen's autobiography, 257.

31 Onghena, 'The survival' (n. 8) 284–285.

32 Schenck, 'Ein internationaler' (n. 11) 558.

33 The AISC was founded by the German Ostwald and the French Haller, and in 1913 Cohen, Biilman, Walden and Wegscheider were voting members. Cohen, Donnan and Bruni studied with Van 't Hoff. Donnan and Henri studied with Ostwald. Cohen, 'Hugo Rudolph Kuyt' (n. 13) 28–29; R. Fennell, *History of IUPAC, 1919–1987* (Oxford 1994) 10; Szöllöszi-Janze, *Fritz Haber* (n. 11) 590–591.

34 Cohen, *Na driekwart eeuw* (n. 1) 192.

The meeting, held completely in German, was more than just sociable.[35] Situated right before the yearly IUPAC conference, Cohen wanted to see 'what can be done'.[36] As the official route proved unlikely at that point, even though some English and Americans already were willing to think about IUPAC reforms, two actions were taken on an informal level.[37] A circular in English, French and German was distributed internationally in which was stated that the Van 't Hoff laboratory would reprint and send any chemical publication that could not be obtained otherwise. Because of the 'world situation' the normal dispersion of scientific communications had been almost completely abolished. The *Journal of the Russian Physical-Chemical Society* for example had not reached Paris since 1914, and the resources were lacking in many central and eastern European nations to acquire foreign periodicals.[38] Coincidentally, one day after the meeting in Cohen's garden, a committee of the KNAW decided to make possible the loan of British and American publications to libraries of the Central Powers.[39] It was through personal correspondence and initiatives like those of the Van 't Hoff laboratory that scientific publications found their way around Europe again.[40] The other outcome was the organization of a bigger, purely scientific meeting the following year. What Cohen would later call the 'Pacification of Utrecht' had to clear the poisonous clouds that were still obscuring the international chemical community by its focus on friendly intercourse about chemical ideas.[41] The chemists present in 1921 anticipated success in different gradations: the depictions 'successful experiment' and 'solemn occasion for the rebirth of peace' were surpassed by the 'dithyrambic words' of the Russian-German Walden who placed the meeting in the context of the Dutch conquest over sea.[42] This internationalist initiative by a neutral nation was presented as a model for the moral role of science in society and, ambiguously, as national virtue. The multidirectional plan that the Dutch chemists had now delineated attended the personal network of chemistry and emphasized the importance of the intellectual exchange of ideas for international science.

The intricacy of inviting appropriate 'nuclei'

In the loaded atmosphere of the early 1920s Cohen proceeded carefully by first approaching closely befriended chemists in all different nations to return to him lists of 'appropriate persons' – leading scientists who could function as nuclei of internationalist ideas.[43] The Dutch invitation, that contained a complete list of invitees, was sent to about a hundred colleagues around the world. This careful and transparent approach enabled many to recognize old friends, but also raised various problems and criticisms that shed light on a

35 Reinbothe, 'Deutsch' (n. 8) 298.

36 Cohen to Arrhenius, 25 May 1921, KVA Brevkatalogen.

37 G.N. Lewis to Arrhenius, 24 August 1920, KVA Brevkatalogen.

38 Cock, 'Chauvinism' (n. 7) 260; Ipatieff, *The life* (n. 8) 343; J. Nötzold, 'Die deutsch-sowjetischen Wissenschaftsbeziehungen', in: R. Vierhaus & B. vom Brocke eds., *Forschung im Spannungsfeld von Politik und Gesellschaft* (Stuttgart 1990) 777–801, esp. 780–781; Schroeder-Gudehus, 'Challenge' (n. 8) 105; Wegscheider to Arrhenius, 15 February 1920, KVA Brevkatalogen.

39 Notulen Buitengewone Vergadering KNAW, 25 June 1921, NAH 64.14.

40 Cohen, *Na driekwart eeuw* (n. 1) 193; Donnan to Arrhenius, 1 February 1921, KVA Brevkatalogen; Schroeder-Gudehus, 'Challenge' (n. 8) 102.

41 E.J. Cohen, *Vijftig jaren revolutie* (Amsterdam 1939) 16.

42 Schenck, 'Ein internationaler' (n. 11) 558; Donnan to Arrhenius, 24 November, 1921, KVA Brevkatalogen; Walden to Cohen, 28 June 1921, BAL, manuscript of Cohen's autobiography, 251.

43 Cohen, *Na driekwart eeuw* (n. 1) 193.

distorted international community of chemists. When Cohen visited the USA at the end of 1921 for another lecture tour, the head of the University of Illinois chemistry department, William Albert Noyes, told him that many American chemists raised objections.[44] Above all, they understood the Reunion to be a challenge of the IUPAC conference in Lyon that same month, or even as an attempt at constituting a new organizational body that would include the Central Powers. Such responses reflect the continued mistrust of formerly neutral nations and emphasize that neutrality was not an unambiguously positive characteristic. Cohen sent Noyes a telegram stating the nature of his conference: 'Only purpose meeting is bringing scientific men together for scientific work. No talk on legislation allowed. Every rivalry with Lyons excluded.'[45]

Max Bodenstein, who published the German atomic weight tables, tuned the responses of all German chemists before responding.[46] He asked the invitees for their personal view on this 'not at all simple' situation, after which four Berlin chemists would formulate a mean standpoint if necessary.[47] Bodenstein himself thought the pleasure of the meeting to be rather ambiguous –'manche Kollegen wird man gern wieder begrüssen, manche ganz und gar nicht' – but he was willing to give it a try.[48] Remarkably, it was two German chemists who were *not* invited who roused emotions. Arrhenius reported from Berlin to Cohen that 'the Germans' were 'a little bit astonished' by the prominent absence on the invitation list of Noble prize winners Fritz Haber and Walther Nernst.[49] Although both had been leading in the German chemical war initiatives, chairing committees in the Kaiser-Wilhelm-Stiftung für Kriegtechnische Wissenschaften (Kaiser Wilhelm Foundation for Military-Technical Science), it is unlikely that this was a moral appeal by the organization.[50] Many key figures in chemical warfare from all former belligerents were invited.[51] Both men were also well known in Utrecht, and their scientific work remained highly appreciated.[52] But the Nobel Prize awarded to Haber in 1919 had aroused a huge controversy in Entente nations, as it

44 *Chemisch Weekblad* 20:2 (1923) 17–18.

45 Cohen, *Na driekwart eeuw* (n. 1) 194.

46 The German publications were necessitated by the IUPAC exclusion of Germany. M. Bodenstein e.a., 'Atomgewichtstabellen fur das Jahr 1921', *Berichte Deutsche Chemische Gesellschaft* 54 (1921) 181.

47 The four chemists are Otto Hahn, Robert Pschorr, Wilhelm Schlenck and Alfred Stock, 'the proven leader'. Bodenstein to Pfeiffer, 18 March 1922, Universitätsarchiv Bonn (UB) Nachlass Paul Pfeiffer.

48 Ibidem.

49 Arrhenius to Cohen, 20 May 1922, BAL.

50 M. Rasch, 'Science and the military: the Kaiser Wilhelm Foundation for Military-Technical Science', in: R. Macleod & J.A. Johnson (eds.), *Frontline and factory. Comparative perspectives on the chemical industry at war, 1914–1924* (Dordrecht 2006) 179–202, esp. 181–188.

51 Hahn, Stock, Walden and Wieland were all active on Haber's Kaiser Wilhelm Institute that produced offensive and defensive technologies. O. Hahn, *Mein Leben* (München 1968) 117–132. Donnan was a member of the Chemical Warfare Committee. F.A. Freeth, 'Frederick George Donnan. 1870–1956', *Biographical Memoirs of Fellows of the Royal Society* 3 (1957) 23–39, esp. 26. Moureu, Urbain and Grignard were leading French research into chemical warfare. P. Bret, 'Managing chemical expertise: the laboratories of the French artillery and the Service des Poudres', in: Macleod & Johnson (eds.), *Frontline and factory* (n. 50) 203–219, esp. 210. Ipatieff was chairman of the Chemical Committee of the Chief Artillery Administration. L. Schmerling, 'Vladimir Nikolaevich Ipatieff, 1867–1952. Biographical Memoir', (Washington D.C. 1975) 91–92.

52 Nernst visited Utrecht many times and Donnan was 'very glad to see' that he received the Nobel Prize. Donnan to Arrhenius, 24 November 1921, KVA Brevkatalogen. The friendship between Haber and Cohen originated at a meeting of the Bunsen society in 1908. There, Cohen reunited with Bredig and Van 't Hoff, and met Bodenstein, Stock and Haber, whom he would later all call 'Dutzbrüder' (be on first-name terms). Cohen, *Na driekwart eeuw* (n. 1) 109–110.

was believed that the discovery of ammonia synthesis had actually prolonged the German war effort, and Haber was also seen as initiator of the use of poison gas. That the antipathy resounded down to the level of the actual science can be seen in an address by the notable French chemist Victor Grignard, in which he ascribed the discovery of the fundamentals of the Haber process to two French chemists.[53] And although mobilization of a nation's chemical know-how was ubiquitous in the war, the active and rhetorical promotion of one's side was not. Both Haber and Nernst signed the 1914 *Aufruf an die Kulturwelt* and spread it in their international networks. The immense symbolical meaning of this action can be understood by the fact that French and Belgian scientists would demand retraction of the manifesto far into the 1920s.[54] The absence of Haber and Nernst is ascribed by the Germans themselves to the persevering public image of these men as 'war criminals'.[55] The protean public image of these two chemists indeed carried such destructive symbolic power that their presence would surely have offended French and Belgian chemists severely. This silent concession was thus necessary in the Dutch attempt to uphold neutrality and avoid getting caught in post-war rhetoric. But the collective response received from France demonstrated that the first was extremely difficult and the second inevitable. The twelve French invitees represented by Charles Moureu (1863–1929) apologized for having to decline the invitation because of existing 'difficulties'.[56] Cohen, with rock-solid trust in transparency and his good intentions, attempted to 'take away unfortunate misunderstandings' by recollecting the rationale of the Reunion and Timmerman's negative response of 1921. The French chemists were not at all familiar with 'Cohen's project', but maintained that the event would 'do more harm than good'. The Belgian refusal, that was unknown so far, was dubbed 'critical' and out of solidarity with their Northern neighbours the French kept to their decision.[57]

The wounds of the war had clearly not yet healed in the countries most affected. For the Weimar Republic the Versailles treaty and the ensuing war debt were particularly painful, so that industry and government had to foot the bill for the attending chemists.[58] In Soviet Russia, the deplorable financial circumstances were not the only cause for concern. While N.A. Schilov had his expenses covered by the Dutch organization, three others were denied passports to travel out of the country.[59] This fitted the Communist isolationist policy, as part of which Russia did not join IRC or IUPAC, and the purchase of chemical supplies from abroad was prohibited for several years. This situation caused Germany and Russia

53 V. Grignard, 'Address', *The Journal of Industrial and Engineering Chemistry* 9:12 (1917) 1142–1143.

54 See for example W.A. Noyes, *Building for peace II – international letters* (Cambridge 1924).

55 Arrhenius to Cohen, 20 May 1922, BAL. No reliable source on an official accusation of Haber and Nernst as war criminals exists. Schroeder-Gudehus, 'Internationale' (n. 10) 858.

56 Moureu e.a. to Cohen e.a., 3 April 1922; Cohen e.a. to Moureu e.a., 3 May 1922; Moureu e.a. to Cohen e.a., 1 June 1922, BAL, manuscript of Cohen's autobiography, 256–258. Cohen, 'Hugo Rudolph Kruyt' (n. 13) 32; Jorissen, 'Réunion Internationale' (n. 2) 418.

57 Even though Grignard signed both letters, Cohen had understood from personal communication that his cancellation was due to his occupation with the organization of the IUPAC conference. Cohen, *Na driekwart eeuw* (n. 1) 194–195.

58 Arrhenius to Cohen, 20 May 1922, BAL; Bodenstein to Pfeiffer, 18 March 1922, UB Nachlass Paul Pfeiffer; Hahn, *Mein Leben* (n. 51) 137.

59 Hahn, *Mein Leben* (n. 51) 137; Schenck, 'Ein internationaler' (n. 11) 559. The absence of the three Russians was still a mystery during the Reunion. Cf. *De Tijd* (24 June 1922); *Het Vaderland* (24 June 1922).

to fall back on each other as long as scientific Europe remained divided.[60] The absence of Vladimir N. Ipatieff, chairman of the 'Chemical Committee' of the 'Supreme Council of National Economy', is to be understood in the context of the immense agricultural and industrial shortages. During his travels around Europe visits for trade and industry purposes simply had priority over his scientific work. Even though he met the initiator of the Reunion, Donnan, in London in 1922, he surprisingly did not mention his invitation for the Utrecht conference.[61] From Sweden, Cohen received a cancellation from his close friend and prominent chemist Svante Arrhenius. It has been suggested that the Scandinavian countries were seen as competitors on the market of mediation in international science, but in this case the organization insisted on the 'absolutely essential' presence of this Swedish 'genial and friendly mediator' that would add 'luster to the movement'.[62] But Arrhenius had exhausted all his holidays in his spring travels to Copenhagen, Haber and Nernst in Berlin, Paris and the Solvay conference in Brussels. It is a further indication of the informal nature of the meeting that he could not be officially dispatched to Utrecht.[63] From the intricacy of invitations, a small but instable international chemistry community appears that was still disturbed by the fresh memory of the war and its materially destructive consequences.

Primary Nucleation: The Reunion

The spring of 1922 was full of international conferences on chemistry. In between the first Solvay conference on chemistry late April in Brussels and the third IUPAC meeting at the end of June in Lyon, the International Chemical Reunion in Utrecht was exclusive in the composition of its attendants (fig. 2). It was the first meeting of chemists from Germany, Austria, England and the USA since the beginning of the war. And where the Belgian industrial Solvay and the Paris based IUPAC proceeded in either French or English, the scientific discussions and speeches at the Reunion were trilingual by rule. The official report of the Utrecht meeting was purposely written in French, as to make it 'readable to foreign chemists', an attempt of the Dutch organization to reach the Belgian and French scientists that declined the invitation.[64] As the IUPAC meetings were primarily concerned with nomenclature, patents and values of constants and atomic weights, the Reunion differed in its focus on scientific content.[65] It is telling that Cohen directly cuts short the discussion after Mieczysław Centnerszwer's proposal for a new mass unit.[66] The keynote lecture that opened the Reunion was given by Edward Charles Baly from Liverpool, on 'Photochemical Catalysis'. It was a very topical lecture about the potential importance of Max Planck's quantum theory for chemical dynamics, including the work of several chemists present in

60 Nötzold, 'Die deutsch-sowjetischen' (n. 38) 778–779; Reinbothe, 'Deutsch' (n. 8) 288–289; Schmerling, 'Vladimir Nikolaevich Ipatieff' (n. 51) 93.

61 Ipatieff, *The life* (n. 8) 310–347.

62 Van Berkel, *De stem van de wetenschap* (n. 12) 21–25. Donnan to Arrhenius, 2 August & 24 November 1921, KVA Brevkatalogen.

63 Arrhenius to Cohen, 22 January & 22 June 1922, BAL.

64 Jorissen, 'Réunion Internationale' (n. 2); Jorissen, 'Negen jaren' (n. 24); *Recueil des Travaux Chimiques des Pays-Bas* (1922) 516–612. For the importance of language in international science, see Reinbothe, 'Deutsch' (n. 8).

65 Holden, 'Atomic weights' (n. 9). 'International congresses', *Industrial and Engineering Chemistry* 19:12 (1927) 1306–1307.

66 Radion, 10–21 g. Jorissen, 'Réunion Internationale' (n. 2) 423.

Fig. 2: Group picture at the International Chemical Reunion Utrecht, 1922. *Top row (from left)*: H.G. de Jong, Pregl, Emich, Skrabal, Snijder, Petersen, Jorissen, Schilow, Klemenc, Mej. Innes, Bronsted, Dubsky, Simek, Bruins, Mej. Broek, Mej. de Meester. Mej. Bolk, Mej. Modderman. *Second row*: Van Arkel, G. van Romburgh, Winther, Dennis, Kailan, Billiter, Abel, Hahn, Backer, Centnerschwer, Pfeiffer, Reinders, Piccard, Blanksma, Moesveld, Mevr. Cohen, P. van Romburgh, Kruyt. *Third row*: Bjerrum, Lewis, Bodenstein, Bredig, Wegscheider, Cohen, Schlenk, Baly, Walden, Noyes, Stock, Holleman, Wieland, Donnan, Schenck, Jaeger. *Below*: Tendeloo, van der Burg, de Pauw. Boelman, Koolhaas, H.L. de Jong. Picture made available by Ulco Kooystra (RUG). See: U. Kooystra, *Bescheiden maar Onverzettelijk: Een biografie van professor Hilmar Johannes Backer* (Groningen 2009).

the lecture room.[67] Its scientific relevance is evident from the fact that the topic was also one of the pressing issues discussed at the Solvay conference.[68] Baly's main contribution is the principle of photochemical catalysts; molecules that are not only able to absorb energy, but also to radiate it again, stimulating other molecules to react. The initiators of the meeting of course hoped that all chemists present would absorb internationalist energy to stimulate, like catalysts, less willing colleagues upon their return home.

On Thursday morning the first lecture by Paul Walden concerned itself with free radicals, a 'textbook example' of the development of chemical knowledge.[69] Part of such a development, R. Schenck later notes, is the insight that chemical issues can only properly be approached 'without attention to national borders'.[70] The rest of that day and the next morning thirteen lectures were presented on recent findings and experiments on topics varying from Germanium (Dennis and Schenck) to the coupling of carbon monoxide with chlorine (Bodenstein). That the majority communicated not so much finished high end papers, but rather open-ended research results indicates that there was no serious streamlining of the scientific content by the organization: good fellowship was the primary aim. Furthermore

67 Work of Bjerrum, Bodenstein and the absent Grignard is mentioned. E.C.C. Baly, 'Photochemical catalysis', *Recueil des Travaux Chimiques des Pays-Bas* 41 (1922) 516–529.

68 M.J. Nye, 'Chemical explanation and physical dynamics: two research schools at the first Solvay chemistry conferences, 1922–1928', *Annals of Science* 46 (1989) 461–480, esp. 464.

69 P. Walden, 'Ueber Freie Radikale', *Recueil des Travaux Chimiques des Pays-Bas* (1922) 530–556.

70 Walden mentions contributors from all over Europe, amongst others: Antoine Laurent Lavoisier, Jöns Jacob Berzelius, Justus von Liebig, Dmitri Ivanovich Mendeleev, Hugo de Vries, Svante Arrhenius, William Ramsay, A.E. Tschitttschibabin, Wilhelm Schlenk, Heinrich Otto Wieland, Georg Bredig, and Paul Pfeiffer. Cf. Schenck, 'Ein internationaler' (n. 11) 559.

it indicates that the 'poverty and gravity of the time' hindered proper scientific work.[71] Demobilization caused a sharp growth in student numbers which immensely increased the education obligations for researchers and, especially east of the Rhine, absurdly high prices for all laboratory requirements further obstructed the normal practice of scientific research.[72]

The objective of the organization was twofold, so that besides this exchange of ideas, work was also made of strengthening ties with old and new colleagues. They enjoyed all their meals together in a selection of restaurants in Utrecht and Baarn, and in the afternoons and evenings several excursions touched upon the technological and scientific highlights of the surroundings: a trip with the electrical tram to Zeist, a visit to the 'modern installations' of the Rijksmunt (State Mint) and on the final day a stroll during the twilight hours in the botanical garden.[73] A drink at Hotel de Pays-Bas, offered to the international guests by the Nederlandsche Chemische Vereeniging (the Dutch Chemical Society – NCV), was seized to explicitly underline the moral meaning of the Reunion. In the presence of prominent representatives of the Dutch government, Chemical Council and KNAW, three monumental speeches were delivered.[74] Gerardus Leonardus Voerman, the president of the NCV, officially welcomed all guests and stressed the importance of scientific internationalism for a peaceful world, and he hoped that 'this conference may be the nucleus in a super-saturated solution, round which the crystallization of good international relations will take place.' Went, both as president of the KNAW and as representative of the minister of Education, Arts and Sciences, delivered his speech alternately in French, English and German. He expressed the conviction that it was science that would break the current trend of 'nationalism and jingoism' because 'Wissenschaft kennt keine Grenzen' ('Science knows no borders').[75] Went added a chauvinistic flavor towards the end of his speech as he proudly described the *tache sacrée* ('holy task') of Holland 'to open its frontiers to scientists of all nations and to serve as a link between these scientists, in order to promote science'.[76] Noyes, acting as the spokesperson of the international guests, also mingled international ideals and national pride. This 'tortuous relationship' between neutrality, nationalism and internationalism was common rhetoric among intellectuals in neutral countries.[77]After recollecting a statement by Cohen about the unique and impressive Dutch Nobel Prize ratio, Noyes prophesized about a peaceful future

71 Walden, 'Ueber Freie Radikale' (n. 69) 546.

72 Institutional reformations and a ten- to twentyfold increase in prices of apparatus, chemicals and literature has 'appallingly aggravated' Bredig's work. Bredig to Arrhenius, 17 February 1920 & 16 February 1921, KVA Brevkatalogen. The Austrian Wegscheider had to cancel his subscription of *Annalen der Physik* and had trouble obtaining ether, hydrochloric acid and sulfur iron. Wegscheider to Arrhenius, 15 February 1920, KVA Brevkatalogen.

73 Cohen was involved with the State Mint since 1903 as member of the Dutch Committee for Monetary Systems. Cohen, *Na driekwart eeuw* (n. 1) 196; P. van Romburgh, 'Prof. Ernst Cohen en de Commissie voor het Muntwezen', in: Jorissen (ed.), *Ernst Cohen* (n. 24) 14–16.

74 Mr. J. Allingh Prins, board member of the Octrooiraad/Patent Office, Ir. F. Donker Duyvis, chemical engineer at the Dutch Rijksnijverheidsdienst/State Industry Service, dr. J.P. Treub, director of the candle factory 'Gouda', professor Verkade.

75 Jorissen, 'Réunion Internationale' (n. 2) 421.

76 Ibidem, 422.

77 Widmalm, 'A superior type of civilization' (n. 23) 68–70.

for Europe in which he saw an important role for science and this conference.[78] All three lectures grounded their optimism in Comtean ideals of science that did not correspond to the then-current disturbed situation in international chemistry.[79] It had to become clear in the following years whether science could indeed take a leading role pacifying the world and if the Dutch mediators had set this 'primary nucleation' in motion.

Secondary Nucleation: Reactions to the Reunion

The accounts of the conference that appeared in international journals were furnished as proof of the appreciation of the Reunion as a 'successful event'.[80] The main objective of the meeting, to restore friendly international intercourse, was thought to be attained 'signally' and the 'lavish' entertainment and hospitality that accompanied it was celebrated extensively in several German, Austrian, English and American articles.[81] Where some highlighted contributions of fellow countrymen, Schenck recommended other disciplines to copy this format of 'activating old personal ties for the idea' which gave the Reunion its 'very special meaning'. The Foreign Office of the Weimar Republic considered Schenck's report so important that it was dispatched to all relevant ministries and embassies.[82] This optimistic image was anticipated in the press releases that appeared in Dutch national newspapers during the conference.[83] The content of the newspaper articles varied from modest portrayals, 'good fellowship and hearty discussion', to high expectations, 'the uniting of more colleagues from all over the world will soon follow'. Again Comtean prospects were not lacking: 'international cooperation is vital to enable science to fulfill her task of elevating society intellectually and materially'.[84]

The image of a successful scientific conference offering hope for worldwide peace that was spread publicly was the product of organizers and attendants of the conference, who authored the above mentioned articles. In private correspondence such optimism was not

78 At that moment, there were about five to six million people in the Netherlands against five Nobel Prizes, whereas the USA had only two against a population of over a hundred million. Jorissen, 'Réunion Internationale' (n. 2) 422.

79 The positivist philosophy of Auguste Comte (1798–1857) propagated the adoption of the scientific method in all aspects of human life and society for the general well-being of humanity. At the turn of the century this optimism remained strong in several (scientific) circles, like the actors described here. But 'Comtean positivism' also became pejoratively known as a dehumanizing, technocratic and materialistic philosophy. K. Wils, *De omweg van de wetenschap: het positivisme en de Belgische en Nederlandse intellectuele cultuur 1845–1914* (Amsterdam 2005) 11, 17–21.

80 Jorissen, 'Negen jaren' (n. 24) 5.

81 F.G. Donnan, 'International reunion of chemists at Utrecht', *Nature* 110 (1922) 431; Schenck, 'Ein internationaler' (n. 11); R. Schenck, 'Ein internationaler wissenschaftlicher Kongreß in Utrecht', *Chemiker Zeitung* 102 (1922) 769–770; *The Cornell Chemist* 12 (1922) 4; 'Chemikerzusammenkunft', *Oesterreichische Chemiker Zeitung* 25 (1922) 97–98; 'International Meeting of Chemists at Utrecht', *Science* 56, no. 1445 (1922) 270–272. It could prove very insightful to compare these accounts to reactions on neutral mediation after the 1926 détente. The exorbitant entertainment was not for free, and it is mentioned that Dutch government and chemical industries provided the necessary 'material support'. Detailed sources on this are lacking. Cf. Cohen, *Na driekwart eeuw* (n. 1) 197; Freeth, 'Frederick George Donnan' (n. 51) 29.

82 Reinbothe, 'Deutsch' (n. 8) 298–299.

83 *Nieuwe Rotterdamsche Courant, Ochtendblad A* (22 June 1922); *Nieuwe Rotterdamsche Courant, Ochtendblad B* (23 June 1922); *De Tijd* (24 June 1922); *Vaderland* (24 June 1922).

84 *Het Vaderland* (24 June 1922), 3.

absent, but the Reunion was placed back in 'the most unfavourable current circumstances'.[85] Georg Bredig, a foreign member of the KNAW from Germany, praised the 'admirable tact' of the Dutch hosts and applauded the scientific component, albeit with a sneer to the French and Belgian chemists 'who isolated themselves … and missed the joy of hearing interesting lectures about free radicals'.[86] The principal aim of the meeting for him was 'to forget in science the war and hate', which proved to be hard as he was confronted upon his return with the assassination of Walter Rathenau and the iron grip of the treaty of Versailles on Germany.[87] This inner conflict manifested itself as 'a mournful return from an after all hopeful Utrecht conference'.[88] Thus Bredig's upright praise was tempered as he grew cautious about fostering high hopes over the effects the meeting would have in the direct future.

The hopeful perspectives of participants offer only a limited view on the Reunion. At the subsequent IUPAC meeting Cohen and Kruyt learned in personal conversations that their 'beautiful June days [were] not put to the credit' of themselves and the Dutch Chemical Council.[89] French and Belgian colleagues showed their discontent as they understood the Reunion as an improper expression of the Dutch effort to bring the Central Powers into the IUPAC. The manifestation of the Dutch internationalist point of view, plus the previous conditional entry into the Union, caused a certain level of 'mistrust', expressed in particular by the chairman Moureu. Apparently the French and Belgian fear of becoming isolated from the international scene themselves was realistic, so that the Reunion was perceived as a step in that direction. Cohen went out of his way to make a stand for Moureu, 'a broad-minded man', who only held on to this opinion 'because of the necessity of the situation'. By separating the person from his political views and historical context Cohen seems to suggest that a self-evident correct moral standpoint existed, namely his own internationalism, while at the same time showing empathic insight into the post-war French perspective. Did Cohen combine stubborn pacifism with well-intended understanding? The way the Dutch mediating mission played out in the following years can provide insight. It will also show whether the Reunion and the partly positive reactions to it affected secondary nuclei in the different nations that set in motion further crystallization of international chemistry.

Crystal growth

The Utrecht chemists were certainly in the thick of things, as Cohen was successively elected vice-president and president of the IUPAC between 1923 and 1925. Not long after their informal attempt at restoration of international chemistry, the Utrecht chemists shifted their activities completely to the formal platform. The main goal of their mission was now to make the official organizations truly international by working from the inside. A proposal in 1925 by Schenck, to organize a second informal Reunion on German soil, was even declined by an optimistic Cohen.[90] This change of strategy by the Dutch chemists distin-

85 Bredig to Arrhenius, 16 July 1922, KVA Brevkatalogen.

86 Ibidem.

87 Two months before the German minister of foreign affairs, Walter Rathenau, was murdered he had signed the Treaty of Rapallo that renounced territorial and financial claims of WWI between Russia and Germany.

88 Bredig to Pfeiffer, 23 July 1922, UB Nachlass Paul Pfeiffer.

89 Cohen, *Na driekwart eeuw* (n. 1) 197; Kruyt, 'Herinneringen' (n. 4) 344. The other delegates for the Council were Donker Duyvis, Alingh Prins, Treub, Verkade, Voerman en Jorissen. *Nieuwe Rotterdamsche Courant Ochtendblad C* (24 September 1922).

90 Schenck to Cohen, 17 July 1925; Cohen to Schenck, 25 July 1925, UUM 36.3.

guished them from the mediation efforts by Swedish chemists, who abstained from joining the IUPAC in 1923 because that would not be 'very neutral'.[91] The fact that this Swedish abstention was explained by foreign scientists as German-sidedness once again stresses the highly politicized atmosphere the neutral mediators were working in, and that the Dutch chemists had to work hard, through official and unofficial channels, to keep things moving on both sides of the Rhine. But Cohen's optimism about a nearing formal entry of Germany into international science took a serious knock when in 1925 a Dutch-Danish proposal for reform of the IRC failed, and German scientists were considering a counter-boycott.[92]

Haber, now the main international spokesman for German natural science, concluded that the 'friendly Dutch opinion has not been of decisive importance' and that German willingness for international cooperation had become low.[93] All the energy invested in the mediating mission seemed futile, as opinions in France and Belgium remained unforgiving and the previous German hope was overshadowed by the enduring burden and humiliation of the Versailles treaty. Ultimately, the unremitting exclusion of Central Power scientists from the IUPAC and IRC was more a failure of science in general to break through the impasse than a sign of the limited leverage of neutral mediators. Now science had to follow politics, as the Locarno treaties, that normalized diplomatic relations in Europe, and the subsequent admission of Germany to the League of Nations paved the way.[94] Cohen had to admit that change would not easily occur from within the Union, and Haber feared the power of 'nationalists' in German academic circles who now boycotted the IRC. This made Haber resort to a solution on the level of the French and German governments, only with optional neutral mediation.[95] In the end public opinion, and political conflict between the former belligerents first had to calm down, and no foreigner could force that.[96] For many scientists in these nations war propaganda for a long time proved to be a stronger rhetorical instrument than the internationalist ideal of neutral mediators, as 'time is the only healer in these matters'.[97]

Still, in many ways contact was resumed through correspondence, exchange of publications and foreign visits before the official organs of science followed suit.[98] The 'Cohen Festband' of the *Zeitschrift für Physikalische Chemie*, for the 25 year professorship of this

91 Widmalm, 'A superior type of civilization' (n. 23) 77–78.

92 Reform of the IUPAC could only proceed via the IRC, in which Cohen also seated. Achtste vergadering WIS, 26 September 1925, NHA 64.538. The French IUPAC secretary, Gérard, was still optimistic about a nearing entry of the Central Powers. Baron de Vos van Steenwijk to Cohen, 6 February 1926, UUM 36.3.

93 Haber to Cohen, 23 November 1925, UUM 36.3.

94 Repeatedly Haber stresses that the 'long period' between the normalization of political relations and the possibility of statutory reform in IRC is problematic, especially for chemistry where it will be impossible to invite the Germans in a way 'wie die anderen Nationen' to the IUPAC meeting. Haber to Cohen, 23 November 1925, UUM 36.3. The chairman of the IRC, Jean Picard, expresses to Cohen the hope that 'the League of Nations […] will save the Council out of its impasse'. And, it was the French minister of Education who insisted that the *Société de Chimie Industrielle* invited German and Russian guests to the memorial of the 19th-century chemist Chevreuil. Achtste vergadering WIS, 26 September 1925, NAH 64.538.

95 Cohen to Haber, 26 November 1925; Haber to Cohen, 8 December 1925, UUM 36.3.

96 Fauque, 'French chemists' (n. 8) 132–134.

97 Manifesto of 93 intellectuals, IRC statutes, Versailles treaty, war guilt and chemical warfare remained topics of discussion. Bredig to Arrhenius, 17 February 1922, KVA Brevkatalogen; Noyes, *Building for peace* (n. 54); Perrin to Noyes, 3 April 1923; Donnan to Noyes, 16 October 1924, University of Illinois Archives (UIA) W.A. Noyes papers.

98 Reinbothe, 'Deutsch' (n. 8) 288.

'inexhaustible advocate' for friendly relations between the former belligerents, shows for example that the international situation in science was improving.[99] When scientific work necessitated comprehensive practical arrangements that included Germany, the formal pathways of IRC and IUPAC were sometimes circumvented.[100] Already in 1921 a committee on bibliographic classification invited Central Powers to their meetings and the 1927 opening of the International Bureau for Chemistry in Paris was attended by chemists from the Central Powers.[101] Also historical festivities, like the Benjamin Franklin and Marcellin Berthelot centenaries, were seized to reunite chemists.[102] Haber's attendance at both, and Nernst's at the latter show that the negative associations attached to them had subsided, so that the splendour of their Nobel Prizes remained.

The complete restoration of international relations was brought a step closer in 1928 in The Hague when Cohen and Kruyt invited German, Austrian and Russian chemists to visit the IUPAC meeting as guests.[103] That still not every German, or even everyone who had attended the Utrecht Reunion, was open to the idea of entering the IUPAC, is evident from Wieland's reaction who judged the meeting in Holland to be a 'summery trip to Golgotha'.[104] As he was not the only one with objections, the Verband deutscher Chemischer Vereine (Association of German Chemical Societies) urged the Dutch Chemical Council to organize another meeting with prominent colleagues from all nations to take away these last difficulties. This meeting would take place thirty years after the first The Hague peace convention that had forbidden the use of poison in combat, precisely an important cause for the severe breach in the international chemical community after the First World War. The atmosphere in the Palace Hotel on these two days in late June 1929 was tense, and chairman Kruyt had to tactically adjourn the meeting several times to enable people to hold private discussions in the hallways. Characteristic for the resumption of internationalism in the 1920s, the decisive contact proceeded informally outside the conference room. Eventually representatives of the Danish, English, French, Italian, Dutch and American chemical councils, in the presence of many members of the German association, distilled the 'protocol of Scheveningen', in which they agreed to argue for three changes within the Union: to approve the new IRC statutes, that allowed Central Powers to join, to reconsider Paris

99 Bredig, 'Erinnerungen' (n. 27) 19–21; Donnan, 'Happy days' (n. 24); *Chemisch Weekblad* (1927) 494–495, 527–530. Many contributors were Reunion attendants, and a comparison with a special issue of the journal from 1922 shows that besides German, Austrian, Swedish and Dutch scientists, now also French, Russian, Japanese, English and American chemists are included. *Zeitschrift für Physikalische Chemie* 100 (1922).

100 Kruyt expected that in the domain of physico-chemical symbols practical collaboration soon will be necessary. Holleman, another Reunion attendant and Dutch IUPAC representative, reported that with respect to nomenclature 'cooperation from German side' was experienced. Derde vergadering WIS, 31 May 1924; Vierde vergadering WIS, 27 September 1924, NAH 64.538.

101 F. Donker Duyvis, 'Nederlansche vereeniging voor documentatie en registratuur', *Chemisch Weekblad* (3 December 1921) 666–667.The Dutch delegation that (on initiative of the French) mediated between the commission and the Central Powers consisted out of chemists that were present at the 1922 Reunion. Note on the 'Internationaal bureau voor de chemie', 26 March 1927, NAH 64.446; Holden, 'Atomic weights' (n. 9); Szöllöszi-Janze, *Fritz Haber* (n. 11) 597.

102 Donnan to Noyes, 16 October 1924, UIA W.A. Noyes Papers; Reinbothe, 'Deutsch' (n. 8) 391; Szöllöszi-Janze, *Fritz Haber* (n. 11) 591.

103 With Haber, Bodenstein, Marckwald, Stock, Wegscheider, Ipatieff, Schilov and Tschitchibabin quite some 'old friends' are found under the invites. Cohen, *Na driekwart eeuw* (n. 1) 310–311; Twaalfde vergadering WIS, 30 June 1928, NAH 64.538.

104 Szöllöszi-Janze, *Fritz Haber* (n. 11) 593–597.

as the Union's secretarial centre and to establish a name change into Union Internationale de Chimie, to wash away the nasty taste that the old name still carried.[105] It was after the continuous effort, starting in 1921 in Utrecht and ending in 1929 in Scheveningen, that the practical and emotional objections over German inclusion in the international community of chemists were finally relieved. It was the two symbolic gestures of the protocol that made it possible for German chemists to join the Union, in 1930, with their heads held high. As science remained divided much longer than politics, the ideal of science as moral leader had lost its power. This did not restrain chemists to work around the official routes, nor did it discourage the Utrecht chemists to keep pressing for an inclusive international chemical community. In the end, the community of chemists was the only one that achieved full recovery of international cooperation in a formal scientific organization.[106] That the two chemists from Utrecht, Cohen and Kruyt, played a central role in this process, in many ways and with varying success, cannot be denied.

A nucleus for crystallization?

In this concluding section the impact of the Reunion of 1922 and the empathic capacities of its two main organizers, Cohen and Kruyt, are evaluated. Although the two Dutch chemists first encountered both opposition and praise, eventually they constructed an image of moral righteousness for their internationalist endeavour.[107] Where Cohen was elected IUPAC vice-president in 1923 'even though he was primarily held responsible for the organization of the Reunion', his successive election to president in 1925 was the confirmation that opposition against his internationalist ideas had begun to subside: 'history has proven us right'.[108] The nuanced tone disappeared completely in later accounts. Before any real success, Kruyt deemed their impact as 'enormous' and Cohen was described as a 'born mediator'.[109] When Kruyt wrote an obituary notice for Cohen, who fell victim to the terror of the Nazi regime in 1944, he slightly rewrote history: 'so great was the effect of this successful attempt [the Reunion]' that Cohen was voted chairman of the IUPAC.[110] And Cohen's explicit request to the *Chemiker Zeitung* to display his election as a consequence of the Reunion, makes one cautious about taking these (auto)biographical accounts as criteria for the impact of the Reunion.[111]

Neither does it mean that the Dutch mediators were not deeply aware of the complex feelings and thoughts in the other nations. Although the 'nineteenth century positivist'

105 The *Verband deutscher chemischer Vereine* was amongst others represented by Haber and the 1922 attendants of the Reunion, Bodenstein, Schlenk, Stock and Wieland. See: Cohen, *Na driekwart eeuw* (n. 1) 312–313.

106 Not even the science of the heavens, astronomy, had been able to transcend the earthly conflict. Even though the efforts of De Sitter, chairman of the International Astronomical Union from 1925 to 1928, are presented as the only successful Dutch mediation, his achievement was not full restoration of international organization. Otterspeer & Schuller tot Peursum-Meijer, *Wetenschap en Wereldvrede* (n. 12) 181–188. For further study it would be interesting to add a comparative perspective to this material, by comparing efforts in physics (Lorentz), chemistry (Cohen, Kruyt) and astronomy (De Sitter), as well as Swedish activities in these areas.

107 Cohen, *Na driekwart eeuw* (n. 1) 197–198; Kruyt, 'Herinneringen' (n. 4) 343–344.

108 Ibidem.

109 Bredig, 'Erinnerungen' (n. 27); Kruyt, 'Herinneringen' (n. 4) 343.

110 Kruyt, 'Levensbericht' (n. 28) 271.

111 'Es dürfte sich empfehlen, dass Sie obiges [Cohen's presidency] … in der Chemikerzeitung mitteilen, unter Hinweis auf den Artikel über den Internationalen Chemikerkongress in Utrecht im Jahre 1922'. Correspondence between Cohen and *Chemiker Zeitung,* UUM 36.2, 36.3.

Cohen and the Christian-socialist Kruyt indeed never abandoned their internationalist ideal of 'as complete a cooperation of all nations in science', they always located this, albeit euphemistically, in the 'difficult times'.[112] Kruyt was well aware of the dark shadow 'the problems of the Ruhr area' cast over the 1923 IUPAC meeting in Cambridge, and advised his fellow Dutch delegates in the 'Wetenschappelijke Internationale Samenwerkingscommissie' (WIS, Commission for Scientific International Cooperation) of the KNAW not to restrict themselves to their own perspective: 'reality is simply not the way the Neutrals would wish it to be'.[113] It would be a serious misnomer to characterize either Kruyt or Cohen as a naive pacifist. Cohen was an experimenter through and through, so that he did not blindly cling on to ideas. This 'animal disputax' was open to different viewpoints and put a lot of trust in his experiences.[114] From his main scientific work on allotropes, Cohen learned that the transition temperature of two forms of a material depends on the previous history of this material: an insight he seemed to have endorsed actively in his international undertakings.[115] It is no coincidence that Schenck turned to him as the expert on the 'mood abroad'.[116] As scientists on both sides of the Rhine had little idea of what was going on in the minds of their former enemies, the neutral mediators had a role to play in informing both French and Germans about the situation abroad. After the failed 1925 IRC meeting, Kruyt and Went visited Haber in Berlin and Cohen wrote 'a tactful treatment' in the *Chemiker Zeitung* to provide insight in the international situation.[117]

Ultimately, the Utrecht Reunion is best understood as an experiment, to see whether a positive contribution to the relations in the international chemical community was already possible by a focus on personal ties and scientific ideas. To obtain results, they attempted to exclude political factors from their experimental set-up. This conscious choice was no neutral naiveté. Noyes, inspired by the Reunion, explicitly tried to attend to the war-inflicted political problems that separated French, Belgian and German chemists. A glance at the politicized trouble he got himself into substantiates the Dutch choice to try to forget the loaded political present for three happy June days.[118] In the following years this first experiment became part of a larger research program, in which the organizers of the Utrecht Reunion were fully aware of, and worked on, the difficulties that had to be overcome on both sides of the Rhine.

The First World War had a disruptive impact on Europe and as the 'chemists' war' in particular on the international community of chemistry. Interchange of ideas and persons was abolished for almost a decade, the work of many chemists in Europe was obstructed by deplorable practical circumstances, and the pre-war dominance of German chemistry was

112 Eerste vergadering WIS, 24 February 1923, NHA 64.538; Kruyt, 'Levensbericht'(n. 28) 272; Somsen, *Wetenschappelijk Onderzoek* (n. 13) 173–177.

113 Kruyt, 'Herinneringen' (n. 4) 343–344; Derde vergadering WIS, 31 May 1924, NHA 64.538.

114 Kruyt, 'Levensbericht' (n. 28) 272.

115 Kruyt, 'Levensbericht' (n. 28) 266, 270; H.A.M. Snelders, *De geschiedenis van de scheikunde in Nederland. Deel 2: De ontwikkeling van chemie en chemische technologie in de eerste helft van de twintigste eeuw* (Delft 1997) 52–69, esp. 65–68.

116 Schenck to Cohen, 17 July 1925; Cohen to Schenck, 25 July 1925, UUM 36.3.

117 Bolk to 'Natuurkunde' department of the KNAW, 7 April 1926, NAH 64.802. Correspondence between Cohen and *Chemiker Zeitung*, UUM 36.2, 36.3.

118 Noyes undertook correspondence with Grignard, Marie, Perrin, Hahn, Stock and Wieland about questions of guilt, war debt and chemical warfare. R. Adams, 'William Albert Noyes, 1857–1941', *National Academy Biographical Memoirs* 27 (1952) 180–208, esp. 188; Noyes, *Building for peace* (n. 54).

gradually replaced by American authority. Ultimately it was science as a whole that failed to take the lead in overcoming this war-inflicted chaos. Where the formal organization of chemistry followed international politics, only turning truly international in 1930, practical necessity and personal contact had already brought chemists progressively closer together. For the Dutch chemical community the First World War was of course not as intrusive as it was in neighbouring nations. The combination of a relatively stable national context and an international complex situation proved beneficial for the Utrecht chemists to obtain the aspired position of neutral mediator, an ambition originating from before the war. A necessary condition for this position was Cohen's extensive pre-war personal network. While the negativity of the Dutch political neutrality was still apparent at the constitution of the 'International Research Council', in the following years mediating activities on both sides slowly transformed the perception of Dutch neutrality into a positive, cultural trait, even though the fiasco of 1925 and the following counter-boycott created a crisis of confidence in the meddling of neutrals.[119] The Reunion, and the subsequent subtle efforts of Cohen and Kruyt in the IUPAC provided them credibility and a respected international reputation. Although we do not have to follow the ecstatic praise of Kruyt the biographer, and political developments preceded scientific reconciliation, it is unfair to characterize, like Somsen, the two Utrecht chemists as lacking both impact and empathy. Also the criticism of Schroeder-Gudehus is nuanced, as it is without chauvinism or scientism that the material presented here indicates that the informal and formal activities in the chemical community eventually led to a unique success.

At the turn of the century chemists from all countries had mixed, but the war inflicted harsh separations. As the Utrecht 'nucleus' remained relatively unharmed in these years, Cohen and Kruyt were able to initiate the process of crystallization of the international chemical community. As 'external' factors strongly influenced this process, and many other 'internal' efforts took place, the Reunion and later undertakings of the Utrecht chemists are not a sufficient explanation of the eventual success. Even so, Cohen and Kruyt can be considered decisive nuclei in bringing about the only complete crystallization of an international community in a scientific discipline after the First World War. Before more could follow, the rise of the Nazi regime in Germany obstructed further collaboration.[120] The position of neutral mediator was always precarious but by cautious manoeuvring the Utrecht chemists had managed it. After the Second World War Otto Hahn wrote Kruyt, who he had met for the first time at the 1922 Reunion, that 'the gratitude for the effort, to reconnect Germany with foreign countries, was the death of Cohen in Auschwitz'.[121]

119 Somsen, 'Holland's Calling' (n. 12) 60; I.M. Tames, *'Oorlog voor onze gedachten': oorlog, neutraliteit en identiteit in het Nederlandse publieke debat, 1914–1928* (Hilversum 2006) 263.

120 Schroeder-Gudehus, 'Probing the master narrative' (n. 16) 26.

121 Hahn to Kruyt, 22 May 1948, Archiv der Max-Planck-Gesellschaft, Berlin-Dahlem, III. Abteilung, Rep. 14 Otto Hahn. Nr. 2353.